absence of the minimum of pv at ordinary temperatures, this being due to the fact that hydrogen possesses a very low critical temperature combined with a low critical pressure. For if, instead of taking temperature and pressure in the ordinary units, we take temperature in terms of the critical temperature, and pressure in terms of the critical pressure as units, and then with temperatures as abscissæ and pressures as ordinates construct the curve for the observed minimum points of pv, this curve will be found to be one and the same for all gases. As Wroblewski has shown, it is a continuation of the curve for the vapour pressures at different temperatures of the liquefied gases, pressure and temperature being expressed in terms of the critical. Drawing this curve by the aid of the observations that have already been made with ethylene, carbon dioxide, methane, and other gases, it is found that the pressure for the minimum point rapidly rises with rising temperature, and reaches a maximum of about 3π for a temperature of $1{\cdot}4\theta$. From this point, however, the pressures decrease as the temperature rises, so that, when the temperature is about 3θ, the pressure at which the minimum pv occurs is π, or the critical pressure; and if the temperature be further increased beyond this point the pressure of minimum pv is reduced below the critical, and continues still further to fall as the temperature rises.

Applying this to hydrogen at a temperature of about 3θ, the pressure of minimum pv should be π, the critical pressure, and this as a matter of fact agrees with the result of the above experiments. For 3θ is approximately − 176° C., at which point the required pressure should be the critical or 13·3 atmospheres, and observation shows that at − 183° C. this pressure is fourteen atmospheres, and as, the temperature being lower, we should expect the pressure to be somewhat higher, this is a very close approximation indeed. At higher temperatures the pressure falls below the critical, and this evidently takes place so rapidly that at − 103° C., or for about 5θ, the pressure of minimum pv is so small a fraction of the critical as to be removed outside the range of observation. The critical pressure itself being low of course assists this process.

This, then, explains the behaviour of hydrogen on compression, and why this behaviour differs from that of the other gases. For a gas must be raised to a temperature of over 3θ before it will act like hydrogen, whereas gases have up to the present only been examined at temperatures not far removed from the critical.

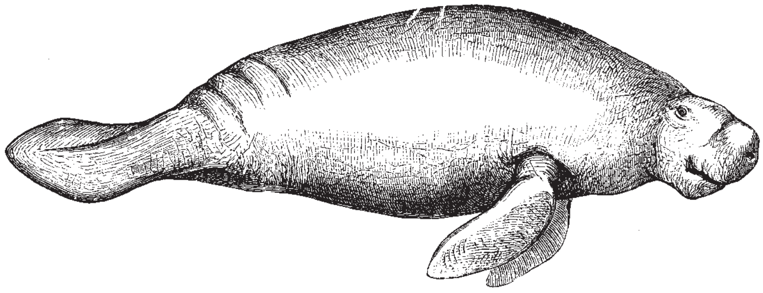
The very low critical temperature of hydrogen is remarkable. It confirms the saying of Regnault, that hydrogen at ordinary temperatures is a gas *plus que parfait*. At the same time it shows that no reliance can be put on Pictet's statement that hydrogen was liquefied at about − 140° C. under a pressure of 360 atmospheres; and whether the temperature attained in Cailletet's experiments was low enough to actually liquefy the gas must be looked upon as extremely doubtful. At the time of his death Wroblewski was planning experiments for the liquefaction of hydrogen, the only thing necessary to make his work complete.

By cooling hydrogen under a pressure of 110 atmospheres to − 213°·8 C. by the evaporation of liquid nitrogen, and then suddenly diminishing the pressure, as low a temperature as − 223° C. was obtained, but the hydrogen still remained in the gaseous state and refused to liquefy.

H. CROMPTON.

THE MANATEE.

THE Zoological Society have added to their living collection in the Regent's Park a young specimen of the Manatee (*Manatus americanus*), which those who wish to have an opportunity of inspecting an extremely curious form of Mammalian life should take an early opportunity of visiting. The Manatees belong to the order *Sirenia* of naturalists, and are sometimes called "herbivorous Cetaceans," although it is, to say the least, very doubtful whether they have any near relationship whatever to the true Whales or order Cetacea. These creatures were abundant in former geological epochs, but since the extermination of the *Rhytina*, or Steller's Sea-cow, at the latter part of the last century, have only two representatives still living on the earth's surface, viz. the Manatee of America and Africa, and the Dugong of the Indian Ocean.



As will be seen by our outline sketch, taken from the Zoological Society's Proceedings, the Manatee is shaped more like a fish than an ordinary mammal. It is formed exclusively for aquatic life, and inhabits the estuaries and rivers of the American and African continents, where it passes its time browsing on the plants beneath the surface and adjacent to the banks. It remains mostly under the water, and only raises its head above the surface to breathe.

The present specimen, which arrived at the Gardens from Liverpool on March 2, is the second example of this singular form that has been received alive by the Society. The first specimen was acquired in August 1875, and lived about a month in the Regent's Park, where it attracted many visitors. When dead, however, it was by no means wasted, as it formed the subject of an excellent article on its anatomy read before the Zoological Society by the late Prof. Garrod, and subsequently published in the tenth volume of the Society's Transactions.[1]

In 1879, a pair of Manatees, received from the Island of Trinidad, lived for several months in the Brighton Aqua-

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[1] A complete account of the anatomy of the Manatee was prepared by Dr. Murie in 1872, from the examination of a specimen of this animal imported from Surinam for the Zoological Society, which unfortunately only lived just long enough to reach England. This will be found in the eighth volume of the Zoological Transactions. The attention of residents on the Amazons should be called to the existence in that river of a second species of Manatee (*Manatus inunguis*), discovered by the great Austrian naturalist, Johann Natterer, in 1830, but as yet little known in Europe.

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rium, and were the subject of some very interesting notes on their habits, prepared by Miss Agnes Crane, and published in the Zoological Society's Proceedings, from which the following particulars are extracted :—

"Lettuces and endives formed the favourite food of this pair of Manatees ; six dozen of these vegetables, weighing 30 pounds, being their average daily allowance. The male would devour at a pinch leaves of the cabbage, turnip, and carrot. Both relished those of the dandelion and the sow-thistle (*Sonchus oleraceus*). Some varieties of a common river-weed were also taken ; but this food was abandoned on account of the leeches with which it was found to be infested Sometimes the animals swim gently about, and pursue the leaves floating on the water. At others, the plants are seized in their mouths, drawn down, and eaten under water, the hand-like fore-fins being employed in separating the leaves The food is invariably swallowed below the surface. The masticatory actions of the animal have been so fully and accurately described by Prof. A. H. Garrod, F.R.S. (Trans. Zool. Soc., vol. x. p. 137), that further remark on that subject is unnecessary. The habits of the animals in captivity, while affording occasional evidence of the ease and rapidity with which they move in the water, do not furnish much support to the views of their capability of habitual active progression on land. Yet it must be admitted that, supplied with a sufficiency of nicely-varied food, they have no inducement to leave the water, and that the construction of their straight-walled tank precludes such efforts as a rule. The male, however, has recently been observed to make some slight attempts at terrestrial movement, turning himself round and progressing a few inches when his tank was empty. With jaws and tail-fin pressed closely to the ground, the body of the animal becomes arched, and is moved by a violent lateral effort, aided, and slightly supported, by the fore-paddles, which are stretched out in a line with the mouth. But the effect of these very laboured efforts was not commensurate with their violence ; in fact, their relation to active locomotion may be compared to those of a man lying prone with fettered feet and elbows tied to side. Nor does the Manatee seem at all at ease out of water, as he lies apparently oppressed with his own bulk, while he invariably makes off to the deepest corner of his tank directly the water is re-admitted. One point may be regarded as definitely settled. Notwithstanding the predilection they have evinced for land vegetables, they never feed out of water. Food has been repeatedly offered them, but it always remains untouched, although readily devoured when the influx of water set the leaves floating on the surface. Although it is possible that the animals can get out of water and remain so for a short period, as they progress so slowly and do not feed out of water it seems as though they must be acquitted of the garden depredations and prolonged wanderings from their native element with which they have been credited."

The Manatee now in the Zoological Society's Gardens has been placed in one of the large warm-water tanks in the Reptile House, the corresponding tank on the opposite side being occupied by a very fine specimen of the Snapping Turtle (*Macroclemmys temmincki*).

After inspecting the Manatee, those who wish for more information on the subject of the Sirenians should visit the Natural History Museum at South Kensington, and examine the splendid mounted skeleton of the *Rhytina*, or Steller's Sea-cow—a recently extinct gigantic representative of the same order of mammals—in the Palæontological Gallery.

THE ROYAL SOCIETY SELECTED CANDIDATES.

THE following fifteen candidates were selected on Thursday last by the Council of the Royal Society to be recommended for election into the Society. We print with the name of each candidate the statement of his qualifications :—

JOHN AITKEN.

He is an accurate, successful, and highly inventive investigator in Experimental Physics, and for the purpose of his investigations has designed and constructed many ingenious and valuable pieces of apparatus. Has carried out a valuable and instructive research regarding the relations between fog and dust in air, and in connection therewith has devised and used methods for counting the number of dust particles in air. The results of his works were given in numerous papers read by him before the Royal Society of Edinburgh, and published in the Proc. and Trans. Roy. Soc. Edin., during the years from 1875 until the present date. Received from the Roy. Soc. Edin. the Keith Prize for 1883–85, for a paper on "The Formation of Small Clear Spaces in Dusty Air" (1884), being a continuation of the subject of a former paper "On Dust, Fogs, and Clouds" (1880), and for contributions on atmospheric phenomena, the more important of these being a series of papers on "Thermometric Screens" (1884–87).

EDWARD BALLARD, M.D. (Lond.),

Physician in H.M. Civil Service. Eminently distinguished as an Investigator of Causes of Disease, and as a promoter of scientific sanitary administration. Has published, *inter alia*, as follows :—On the Influence of Weather and Season on the Public Health, based on the Statistical Study of 272,000 Cases of Sickness (1857–68) ; On Vaccination and its Alleged Dangers (1868) ; A Local Outbreak of Enteric Fever traced to a Local Distribution of Milk (1871) ; Reports to the Local Government Board, year by year, on particular inquiries, local, or more or less general (1871–88). Of the latter the following may be named :—The Effluvium Nuisances which arise in various manufacturing and other branches of industry, studied as to their Effects on the Public Health, and as to their Preventability (1876–78) ; various Studies of Outbreaks of Disease referable to Articles of Food (1873, 1880–88) ; Survey of England as to the Local Preparations against Chlorea (1885–86) ; Studies of the Causation of Epidemic Infantine Diarrhœa in England and Wales (1882–88).

ALFRED BARNARD BASSET, M.A.,

Barrister-at-Law. Author of a treatise on Hydrodynamics, in two volumes (1888) ; also papers in the *Quart. Journ. Math.*, *Mess. of Math.*, *Phil. Mag.*, Proc Lond. Math. Soc., Proc. Camb. Phil. Soc., Phil. Trans. Roy. Soc. (1888), and *Amer. Journ. Math.* These papers treat of the Motion of Liquids about Elliptic Cylinders, of Associated Functions and Spherical Harmonics, of Electric Currents of a Sheet rotating in a Field of Magnetic Force, the Potential of a Spherical Bowl, Motion of a Liquid Ellipsoid and Stability of this Motion, Motion of two Spheres in a Liquid, Potentials of Circular Disks, Motion of a Ring in a Liquid, Motion of a Sphere in a Viscous Liquid, and the Steady Motion of an Annular Mass of Rotating Liquid.

HORACE T. BROWN,

F.C.S., F.I.C., F.G.S., Brewer. Distinguished as an investigator of the Carbohydrates, and of the Phenomena of Fermentation ; also on account of the services he has rendered in introducing scientific methods into the brewing industry. Author of the following and other papers :—"On the Estimation of Ammonia in Atmospheric Air" (Proc. Roy. Soc., 1870) ; "On the Influence of Pressure on Fermentation" (Journ. Chem. Soc., Part I., 1872, Part II., 1873) ; "On the Electrolysis of Sugar Solutions" (*ibid.*, 1872). In conjunction with Mr. Heron :—"Contributions to the History of Starch and its Transformations" (*ibid.*, 1879) ; "Some Observations on the Hydrolytic Ferments of the Pancreas and Small Intestine" (Proc. Roy. Soc., 1880). In conjunction with Dr. Morris :—"On the Non-crystallizable Products of the Action of Diastase upon Starch" (Journ. Chem. Soc., 1885) ; "Determination of the Molecular Weights of the Carbohydrates" (*ibid.*, 1888).

LATIMER CLARK,

C.E., F.R.A.S., F R G.S., Electrical Engineer. Past President of the Institution of Electrical Engineers. Author of:—"Description of the Britannia and Conway Tubular Bridges;" chapter on "Tides of the Menai Straits," in E. Clark's book on

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